

# John Ferbas

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July 19, 2014

I appreciate the opportunity to respectfully express my perspectives on the continuing presence of a toxic polychlorinated biphenyl (PCB) burden at Juan Cabrillo Elementary, Malibu Middle, and Malibu High School. I do so as someone that holds a Masters degree and Ph.D. from the University of Pittsburgh School of Public Health, with additional academic training and a lifelong career as an immunologist and cell biologist in academia and industry. It is my opinion that those in opposition to the request by Malibu Unities to relocate staff and children to temporary classrooms to allow for removal of the PCBs to undetectable levels in the contaminated buildings are supporting an ill-informed and tragic decision.

It is not disputed that the manufacture and widespread use of PCBs during 1950-1979 was a mistake because of the inherent toxicity of the compounds, their persistence in the environment and the property of bioaccumulation in multiple target organs of exposed individuals. With respect to the issue at hand, I see a Hatfield-and-McCoy line emerging on the topic of whether additional environmental testing should be performed, who has the authority to perform such tests and to what specifications, and whether one can occupy the school without a risk that is defined by today's standards. Overall, it is clear that each family who attends or works at any of the schools will soon need to make a decision regarding their attendance if it is expected that they will occupy space that contains PCBs. In my mind, a question that approaches or exceeds the weight of the clean-up debate is whether children and teachers have the right to occupy a publically funded facility without having a variety of cellular receptors unknowingly tweaked every time they cross the threshold of a contaminated space. If one considers that the effects of exposure to many toxins is cumulative, why would anyone align with the idea that we would allow young persons to be exposed to even low levels of substances that are recognized to accumulate in them, with the knowledge that other life experiences (exposures) would add to their balance sheet of risk ?

It seems that some are allowing themselves to get lost in the weeds of what the permissible tolerable limit (PEL) to PCBs may or may not be, or who has the authority to test for PCBs. Why not take the alternative route to decide to truly care about each other by eliminating any potential for exposure to known toxic substances no matter how small? If the PEL concept had any legitimacy, we would still allow for new construction to use PCB-laced caulking so long as it remained below a threshold; but we do not because it is wrong to do so. The fact that Juan Cabrillo Elementary, Malibu Middle, and Malibu High School classrooms

contain caulking with PCB levels orders of magnitude above even the most conservative PEL estimates is egregious. The potential decision to “manage in place” supported by SMMUSD flies in the face of sound reasoning and should be reversed. My reasoning is based upon a number of facts that are readily available in the literature:

1. PCBs are synthetic substances that impart dangerous biological effects in exposed humans and animals. Their manufacture and use is banned worldwide but they persist in our environment because they do not naturally degrade.
2. The exact danger of PCB exposure for a given person is very difficult to determine because:
  - PCBs are a mixture of over 200 related chemical species (congeners), each with varied biological potencies. To even begin to appreciate exposure risk of PCB exposure, one must know the proportion of each species in the mix. These types of assays are available but not commonly performed. Moreover, the risk to humans and animals from PCB exposure is assessed by assigning a toxicity equivalence factor (TEF) that reflects the activity of any individual PCB congener relative to the effect of dioxin on the aryl hydrocarbon receptor, which is arbitrarily assigned a TEF of 1.0. The problem with this scoring scheme is that dioxin is not a PCB, and it is known that PCBs interact with a variety of receptors in addition to the aryl hydrocarbon receptor. So even though the scoring scheme is a convenient reference for scientific study, it falls far short of describing the risk of PCB exposure in a human in a comprehensive way.
  - PCBs bioaccumulate because they persist in our bodies after exposure. In other words, an exposure after ingestion of e.g., contaminated fish is added to an exposure from e.g., inhalation in a contaminated room. Each person, therefore, carries their own unique risk as a function of their life experiences. If one wishes to minimize risk, it is important that sources of known exposure are avoided because everyone will certainly receive additional exposures without their knowledge as a function of their life experiences.
  - Some individuals are inherently more susceptible than others to PCB exposure. In addition to prior sensitization and cumulative exposure from a variety of potential environmental sources, there are

differences in signaling thresholds that may be genetically determined. The age of the individual and other underlying factors are also important determinants of susceptibility.

3. Although permissible exposure limits (PELs) to PCBs in a particular environmental circumstance may allow SMMUSD to comply with legal standards (with the exception of the most egregious exposure), they are neither designed nor capable of protecting individuals in a comprehensive way.
  - Permissible limits for PCB exposure in the United States are higher than those of Japan and Sweden, illustrating that not all experts view the risk of PCB exposure in the same way because we do not know the true answer.
  - Even though it is known that a developing nervous system and brain is more susceptible to the negative consequences of PCB exposure, permissible exposure limits for adults and children are identical. This would be the equivalent of giving an adult dose of Tylenol to a child, something that we would never do because the toxic effect would be magnified in the child.
  - The overall question that each person should ask is how to best limit their cumulative exposure to known toxins, especially those that bioaccumulate. The best strategy is to eliminate circumstances of known exposure, especially when exposures are prolonged and frequent such as the case of attending school or work. This increases the odds that exposure from unknown sources will remain below biologic thresholds that impart harm. A permissible exposure limit set for a given environment is incapable of addressing cumulative exposure from different sources and is therefore of very limited use to individuals concerned with protecting themselves.
4. Biologic dysregulation imparted by PCB exposure is significant and occurs *every time* a cell is exposed despite the lack of a sensory experience in the exposed individual. PCBs chemically mimic natural molecules to stimulate a variety of cellular receptors that are widespread in our bodies. The impact of exposure is induction of a myriad of biochemical changes within and between cells that would otherwise not occur. Stated another way, PCB's turn on a cell's metabolic machinery even though we are unaware of it at the time of exposure, but the event is not without potential catastrophe later on down the road. The odds for catastrophe increase as a function of total (cumulative) exposure.

- Cell receptors known to interact directly with PCB's include ryodine receptors and aryl hydrocarbon receptors, with additional activation and potentiation of GABAa receptors. These are all signaling receptors that are widespread in our bodies. Their natural role is to induce important biochemical changes in our cells as a component of our physiology. These receptor systems were not evolutionarily intended to interact with PCBs, as these substances are synthetic and do not exist in nature.
- Some well characterized biologic effects of PCBs include 1) weak estrogenicity, 2) enhanced insulin production, 3) enhanced arachidonic acid secretion, 4) disruption of thyroid hormone metabolism and signaling, 5) perturbations in calcium signaling and 6) neurotoxicity and disruption of neurodevelopmental events. These biologic changes are all expected to occur within the concentrations of PCBs found in contaminated environments.
- Other effects that may be an outcome of PCB exposure involve deficiencies in the immune system. The exact attributes of immune system dysregulation are more difficult to pinpoint because of the inherent complexity of the immune system itself. Given the receptor touchpoints that PCBs use to interact with cells, however, it is very likely that PCB exposure is not without impact to the immune system.
- It is generally discussed by those in the field that although some effects of PCB exposure may be acute, other effects might be realized only after an extended time period and may only be seen in susceptible individuals. Policy decisions need to incorporate protection of the minority as well as the considering what the majority of outcomes may be.

The citizens of Malibu Unites and any affiliated advocacy groups should be applauded rather than derided for breaking protocol or questioning the motives of the system. The actions of Malibu Unites aligns with the idea that the absolute and total welfare of our children and friends should not be compromised even if remediation translates into difficult economic decisions. The prior decision made years ago by SMMUSD to remove soil that contained insecticides and PCBs (rather than to manage in place) was the right one, and I question why this philosophy is not applied to the current situation. I

genuinely hope that SMMUSD administration will relocate staff and students to temporary classrooms while they reconsider managing the PCB load in place at Juan Cabrillo Elementary, Malibu Middle, and Malibu High School on behalf of those who fund them through their tax dollars. PCB removal is the only route to true elimination of risk to all, and I believe it is this community's right to expect no less.

Sincerely,

A handwritten signature in dark ink, appearing to read 'John Ferbas', with a stylized flourish at the end.

John Ferbas, MS. Hyg., Ph.D.

*Please understand that the facts, views and opinions expressed in this correspondence are my own and are not the views of the University of Pittsburgh School of Public Health, the UCLA Schools of Public Health and Medicine, The Greater Los Angeles VA Healthcare System, or the Departments of Medical Sciences and Clinical Immunology at Amgen ; which are all places that I received education and training, taught, or perform professional functions as an immunologist and cell biologist.*